INERTIAL CONFINEMENT FUSION
Lawrence Livermore National Laboratory

Monthly Highlights

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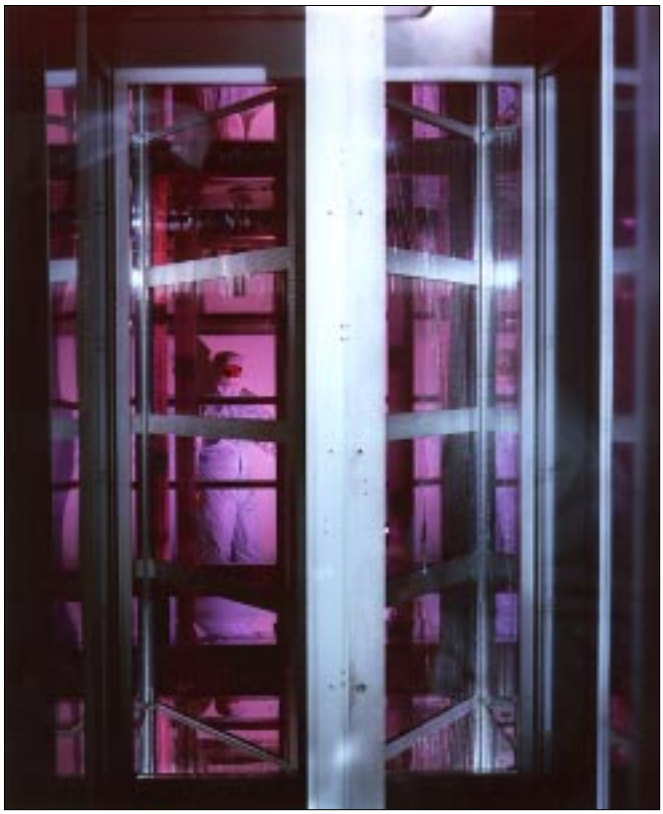
Nova as a "20-Beam" Laser. We have effectively doubled the number of beamspots on Nova by propagating two different pulse shapes on each half of the 10 Nova beamline split-glass amplifiers. Using a single lens, the pulses from each half are partially defocused at the target plane to provide two adjacent beam spots with a continuously adjustable power ratio. Applied to a cylindrical hohlraum target, this "20-beam" Nova variant provides a NIF-like two-ring irradiation geometry for testing advanced symmetry control concepts required for achieving ignition.

NIF AMPLAB. We have performed gain measurements on a full-size 4-slab-high × 2-slab-wide × 1-slab-long prototype amplifier with a flashlamp pump cavity nearly identical to the NIF baseline amplifier design. The results, which were in excellent agreement with 2D ray-trace code predictions, are consistent with the NIF amplifiers achieving an aperture-average gain coefficient of 5%/cm. The prototype amplifier, shown below, had a full complement of laser glass and was outfitted with specially shaped flashlamp reflectors and antireflective coatings on the blastshields to increase pumping efficiency.

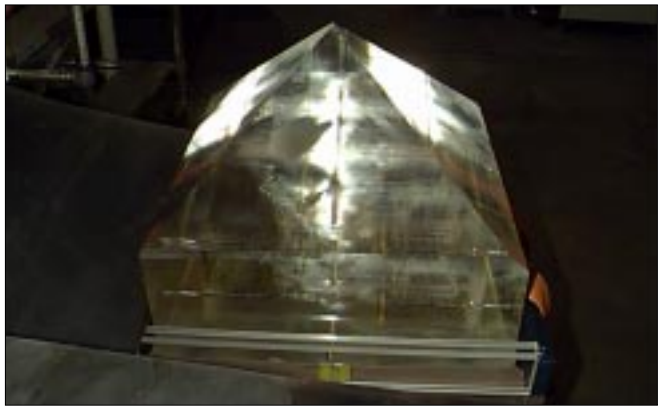


The assembled amplifier seen from the north mirror tower.

NIF Construction. NIF construction packages for the site preparation, foundations, the laser building shell, and the optics assembly building were awarded on schedule. The first contract (under $1M) was awarded to Red Top Construction of Hayward, California. Digging the "big hole" was done by Teichert Construction of Stockton, California, in a contract under $2M. The third contract, of $4.2M (to do the foundation and concrete slab work) was awarded to Walsh Pacific of Monterey, California. The $11.4M contract for constructing the laser building shell was awarded to Neilson Dillingham of Pleasanton, California. Preparations for the remaining construction contracts are proceeding on schedule.

NIF KDP Rapid-Growth Program. Over the last few months, a great deal of progress has been made in the rapid growth of KDP and KD*P (deuterated) crystals for the NIF. Shown below is a KDP boule measuring 57 × 57 × 47 cm, which is the minimum size required for NIF second-harmonic-generation crystals. Larger, crack-free, and higher-optical-quality crystals resulted from thermal expansion coefficient matching of the growth-platform base plate to the crystal material. An additional KDP boule measuring 55 × 55 × 38 cm was grown with a continuous filtration system installed and operating for the duration of the run. Crystals grown in small tanks with continuous filtration have been tested and show a significant improvement in damage threshold over those grown without constant filtration.

A KD*P boule measuring 52 × 51 × 38 cm has also been grown, but it does not have sufficient height to yield a third-harmonic-generation plate. Experiments are under way to increase the aspect ratio of these crystals. We have demonstrated NIF damage thresholds in small KD*P boules, but have not yet evaluated the 52-cm boule. The large crystals still contain some inclusions, so work continues on improved system design and process optimization.



57 × 57 × 47-cm KDP crystal.

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